Leptons

ST230

Programming guide

Firmware version: **ST230 B5.3**

DATAPROCESS EUROPE.p.A.
20082 Binasco (MI)
Viale dell'Artigianato, 19
Tel. 02 900221
Fax.02 90091353

Leptons

CONTENTS

Connection to external devices page 4

- Communication protocol page 4
- Network operation page 5
- Optocoupled interface page 7

Commands for printer control page 8

- Control characters page 8
- Printable characters page 9
- Slash sequences page 11
  - `//` page 11
  - `/!` page 11
  - `/#` page 11
  - `/@` page 11
  - `/$&%nnnnnnnnnnnnnnnn` page 12
  - `/Awrc` page 13
  - `/Bthhhc..ce` page 13
  - `/C` page 16
  - `/Dfpppllld..d` page 16
  - `/Exxxxyyyy` page 17
  - `/Ffhv` page 18
  - `/Gxxxxyyyy` page 18
  - `/Hssss` page 19
  - `/I0` page 20
  - `/I1nv..vmppss` page 20
  - `/I2ssssnnc..c` page 20
  - `/I3ssssthhhc..ce` page 20
  - `/I4ssssbbbllll` page 20
  - `/Jhhss` page 21
  - `/Kpdet` page 22
  - `/Ldllllltt` page 23
  - `/Mwwwwhhhhttt` page 24
  - `/Nssssoooo` page 24
  - `/Onnnn` page 25
  - `/Psss` page 25
  - `/Qbbbllllg..g` page 26
  - `/Roc` page 27
  - `/Sc` page 27
  - `/Tn` page 28
  - `/Umm` page 28
  - `/Uddfffffffff` page 28
  - `/Vssffeppp` page 29
  - `/Wnnnn` page 30
  - `/Xiiippp` page 31
  - `/Yc..c` page 32
  - `/Z` page 33

Return codes page 32

Buffer status page 32
Sensors status page 33
Printer status page 34

Font EPROM page 36

Character maps page 37
Small font page 38
Normal font page 39
Big font page 39
Symbols font page 39
Pictures font page 39
Standard fonts example page 39

Macro EPROM page 39

Macro linker page 40

Built-in macros page 41

TABLE "A" page 57

CONNECTION TO EXTERNAL DEVICES

The printer is equipped with a 9 pin, “D” type, female connector located on the rear panel, through which a bidirectional RS232 asynchronous communication can be established with external devices (typically a Personal Computer or other equipment with compatible interface).

Pin numbers and functions are the following:

1 not used
2 input, received data (RxD)
3 output, transmitted data (TxD)
4 not used
5 ground (GND)
6 not used
7 output, request to send (RTS)
8 input, clear to send (CTS)
9 not used

Communication speed is selectable through front panel in set-up mode (the value is permanently stored in non-volatile memory) and the baud rates corresponding to the “BR” parameter shown in the “status label” are the following:

0 = 38400 bits/second
1 = 19200 “ “
2 = 9600 “ “
3 = 4800 “ “
4 = 2400 “ “
5 = 1200 “ “
6 = 600 “ “
7 = 300 “ “

The other communication parameters are fixed and have the following values:

8 data bits
no parity
2 stop bits (transmitted, 1 is enough to receive)

COMMUNICATION PROTOCOL

The receive channel is interrupt-driven and incoming characters are temporarily stored in a 65535 bytes input buffer (First In - First Out) from which they are subsequently fetched by the Command Interpreter.

At switch-on, the RTS line remains inactive (negative level) until the printer has completed the initialization phase, that takes several seconds, after which RTS goes active (positive level) to indicate that the machine is ready to receive data.

The RTS line normally stays active, even if the machine is currently printing or processing previously received commands, until the number of characters in the buffer increases above 60000 (either because communication speed is faster than processing speed or because the printer is OFF-LINE or printing and thus it is not processing at all), at which time RTS goes inactive to indicate that the printer cannot accept data any more. RTS goes active again when the number of characters in the

buffer decreases under 50000.

The margin of 5535 characters is provided to avoid loss of data in case that the transmitter does not stop immediately upon detection of the high-to-low transition of the RTS and an hysteresis of 10000 characters is provided to avoid transmitter overhead when working in buffer saturation conditions.

An XOFF character (ASCII **DC3**, code 13 hex, 19 dec) is sent by the printer when RTS goes low and at every character received while there are more than 60000 characters in the buffer (RTS already low), while an XON (ASCII **DC1**, code 11 hex, 17 dec) is sent when RTS goes high. This standard XON/XOFF protocol allows even simple 3-wires connections, using only RxD, TxD and GND, leaving open CTS and RTS.

If a framing error is detected in the received data, the **BEL** character (ASCII code 7) is transmitted to inform the external device that received characters may have been lost. This generally indicates a noisy transmission line.

The transmit channel is also buffered with a 4096 character output buffer, but the flow of data from the printer to the external device is controlled only by the CTS line: the XON/XOFF protocol has not been implemented on the transmit channel because it would interfere with the received data.

When the CTS line is held at a positive voltage by the external computer, the data contained in the transmit buffer (if any) are sent on the serial line, while holding the CTS negative, transmission is inhibited and the data generated by the printer during operation are accumulated into the buffer. This means that the printer can operate even if the external computer is temporary busy (over 500 labels can be printed in this condition before the printer stops for buffer full). The CTS line is checked between each character transmitted and thus transmission is immediately stopped when it goes negative.

The CTS line should be permanently tied to a positive level if the external device cannot process messages sent by the printer, to avoid hang-on of the printer itself (it may also be left open, as it is internally pulled-up).

Note: due to the fact that the machine is normally ready to receive, at least until the buffer is almost full, even while it is printing, there may an interference between the two activities (printing and receiving) at high baud rates (above 9600 baud) and/or at high print speeds (above **/V0505....**), consisting of a more or less visible truncation of the last portion of the printed label. To avoid this interference, it is possible to configure the machine (**/$&%** command) so that it keeps the line busy (RTS low, XOFF sent) during printout of each label, getting ready (RTS high, XON sent) only for a short time between two labels.

NETWORK OPERATION

The behavior of the printer when it is configured for network operation (NA>00) is basically the same described in the previous section, with some variations, described in this section (please note that the printer can work in this mode only if equipped with the optionally available network adapter that replaces the standard RS232 connector).

The transmission medium for the ST230 network is a coaxial cable (typically the "thin" Ethernet 50 ohm type, RG58 or equivalent) with BNC connectors and "T" junctions linking together the computer, equipped with the appropriate interface on the serial port, and up to 15 printers, each galvanically insulated from the others, within maximum distances of several hundred meters.

Due to the half-duplex nature of the network, a master-slave communication protocol has been implemented, where the computer (master) is always the originator of any activity on the line and the printers (slaves) send data only when requested.

The RTS and CTS lines are no more used for data-flow control, which now relies only on the XON/XOFF mechanism: RTS activates the 5 MHz modem carrier (carrier ON when RTS is at positive level), while CTS detects the presence or absence of the carrier (carrier ON when CTS is at negative level). It's responsibility of the application program running on the external computer to check the presence of the CTS (indicating that the line is free), then set the RTS before starting transmission and reset it after the last character has been sent. Please note that the network interface adapter automatically echoes back any character transmitted: this must be kept in mind when designing the software driver.

Each printer connected on the network must have a unique network address (indicated by the "NA=xx" field printed on the status label), ranging from 01 to 15, that currently represent the maximum number of printers that can be connected to the same network. Set-up of the network address is possible only through the front panel of the printer, in a way similar to selection of baud rate and character map (see the section describing SET-UP mode).

When operating in network mode (00<NA<16), the printer is by default inactive after switch-on (it does not send any character and ignores received data) until it recognizes the appropriate activation sequence composed of an ASCII control character whose code is equal to its address plus 16 (codes 11 to 1F hex, 17 to 31 dec), followed by **US-US-NAK** (codes 1F-1F-15 hex, 31-31-21 dec).

When the printer recognizes its own activation sequence, it first sends all the characters currently contained in its transmit buffer (transmission is triggered by the low-to-high transition of the CTS line, indicating that the master has switched off its carrier), terminating them with an **EOT** (ASCII code 4), then it enables the receive buffer and begins behaving like a normal, non-networked printer, with the only difference that any status information produced during printing (or when a status request is processed) is buffered and it is not automatically transmitted until another activation sequence is received. If the transmit buffer is empty when the activation sequence is received, only the EOT is transmitted.

When the printer recognizes the activation sequence addressed to another printer, it inhibits the receive buffer and ignores all subsequent incoming characters until the next activation sequence addressed to itself.

This master-slave architecture requires a periodic polling of all the printers on the network, particularly of those that are printing, to avoid saturation of their transmit buffers, whose size (4 Kbytes) allows an autonomy of about 500 labels, after which the machine suspends operation. Furthermore, when sending a lot of data to the same machine and/or working in spooling mode, it is necessary to periodically interrupt transmission and resend an activation sequence to the printer, allowing it to notify possible overflows of the receive buffer by sending back XOFF characters.

OPTOCOUPLED INTERFACE

The printer may be optionally equipped with an additional connector (9-pin, male, "D" type) located on the back panel beside the power transformer, which carries some optocoupled Input/Output signals useful to interface the machine to external devices (typically industrial PLCs I/O pins or relays).

Pin numbers and functions are the following:

1	+ READY output signal (collector of NPN optocoupled transistor)
2	– READY output signal (emitter of NPN optocoupled transistor)
3	+ START input signal (anode of optocoupler's diode)
4	– START input signal (cathode of optocoupler's diode)
5	GROUND (non optocoupled)
6	+ 5 VDC (non optocoupled, 100 mA max)
7	+ PRINT output signal (collector of NPN optocoupled transistor)
8	– PRINT output signal (emitter of NPN optocoupled transistor)
9	+ 22 VDC (non optocoupled, 500 mA max)

Output signals are directly connected to collector and emitter of BD679 transistors (darlington) which may safely carry a current up to 200 mA and stand a voltage up to 30 VDC, while the input signal current is limited by a 2.2 KOhm series resistor, which allows input voltages in the range of 10 to 30 VDC, resulting in direct compatibility with standard 24V industrial PLCs.

The READY signal indicates the normal working condition (printer ON-LINE) when the transistor is ON and, viceversa, it indicates that the machine, for any reason, is not operating (printer OFF-LINE) when the transistor is OFF. See the section describing printer error codes (Return Messages/Printer Status) for detailed information about the possible error situations in which the machine may go OFF-LINE.

The START input signal may be used to trigger the printing phase or the application phase, according to current printer configuration, which also determines the active polarity (see the description of the **/K** command for further details). This signal is physically in parallel with the one coming from the optional label dispensing photosensor

The PRINT signal is activated (transistor ON) at the beginning of the printing phase of each label, as soon as the stepper motor starts moving, and is deactivated (transistor OFF) at the end of the cycle, which includes the cutting or application phase, if the printer is equipped with the optional cutter or applicator and they are enabled. This signal is also activated if a single cut or application cycle is requested with the **/!** command.

The +5 VDC and +22 VDC pins, together with the GROUND pin, are provided to ease interfacing of external circuits requiring a limited amount of power, directly supplied by the printer, with no need for an external power supply. This is specially useful when relais are used to buffer the READY and PRINT signals and provide clean contacts to the external world.

Note: the +22 VDC pin carries out the printhead supply voltage, which has a nominal value of 22 volts, but it may vary in the range of 16 to 25 volts, depending on current printhead temperature and power setting (the nominal value is obtained at 25°C with power setting of 730 mW for the 6 dots/mm and 580 mW for the 8 dots/mm).

COMMANDS FOR PRINTER CONTROL

The Command Language adopted to control operation of the ST230 is proprietary (i.e. it is not compatible with that of any other commercially available printer) and uses various combinations of ASCII characters, sometimes mixed with binary (8 bit) data, to define all the commands that the printer recognizes.

There are two separate Command Interpreters in the ST230: the main one processes data contained in the receive buffer as a serial stream of characters (or bytes) and sequentially executes the required actions, the secondary one only recognizes a limited number of commands (sequences of 4 consecutive control codes) and it operates in real-time, as soon as the characters are received and before they are placed into the buffer.

The following sections describe the commands recognized by the printer, dividing them in three groups: control characters, printable characters and slash sequences.

CONTROL CHARACTERS

The printer ignores all control characters received (ASCII codes in the range 00 to 1F hex, 0 to 31 dec) except the following ones:

ENQ Enquiry (05 hex, 5 dec): it is interpreted as a status request and forces the printer to send out a message containing information about the current status of the machine (for more details see the section concerning return codes).

BS Back Space (08 hex, 8 dec): it moves the cursor back on the last character entered, to allow overtyping (typically used for accented letters not available in the standard character set).

LF Line Feed (0A hex, 10 dec): it moves the cursor down, with respect to the current printing direction, of an amount determined by the current value of the interline parameter.

FF Form Feed (0C hex, 12 dec): it prints one label with the current contents of the buffer (equivalent to **/W0001**). It can be disabled with the **/$&%** command.

CR Carriage Return (0D hex, 13 dec): it moves the cursor left, with respect to the current printing direction, to the initial position set by the last **/E** command.

The printer also recognizes some sequences of 4 consecutive control characters representing commands that are executed immediately instead of being buffered and then sequentially processed by the command interpreter. The sequences are the following:

VT-US-US-NAK (0B-1F-1F-15 hex, 11-31-31-21 dec)
It puts the printer busy, resetting the RTS line negative and sending an XOFF. The printer goes back automatically ready (setting RTS positive and sending an XON) as soon as all the pending commands have been processed and completed (receive buffer empty). This command sequence is very useful whenever it is

necessary to disable the input buffer.

SO-US-US-NAK (0E-1F-1F-15 hex, 14-31-31-21 dec)
It clears all the data currently stored in the receive buffer (if any).

SI-US-US-NAK (0F-1F-1F-15 hex, 15-31-31-21 dec)
It aborts the printing session in progress (if any) after completion of the current label. If the printer is waiting for variable data during a printing session, this is aborted without printing the next label. If other data are present in the receive buffer, the machine goes on processing them after having aborted the current printing session. This command can also be used to abort processing a pending command sequence, immediately setting the machine ON LINE.

DLE-US-US-NAK (10-1F-1F-15 hex, 16-31-31-21 dec)
It emulates the operation of the ON LINE key, allowing to put the machine ON-LINE/OFF-LINE and also to pause/resume a printing session.

Furthermore, any sequence starting with a control code in the range **DC1** to **US** (11 to 1F hex, 17 to 31 dec) followed by **US-US-NAK** (1F-1F-15 hex, 31-31-21 dec) is interpreted as an activation code if the printer is working in network mode and the character code equals the machine's addres plus 16 (see the appropriate section for more details).

Note: the choice to use 4-character sequences for these commands derives from the consideration that, even if there is a high probability to encounter such codes embedded in the binary data associated to the **/Q**, **/D** and **/Y** commands, it is very unlikely (although not impossible) to find them exactly combined as in these sequences, thus avoiding, in practice, that the real-time Command Interpreter executes undesired commands when analyzing incoming characters during reception of bit-mapped graphics in binary format, fonts or character maps. These control codes have been selected because they do not interfere with the main Command Interpreter, that simply ignores them.

PRINTABLE CHARACTERS

The printer interprets all codes between 20 hex (32 dec) to FF hex (255 dec) as printable characters, except code 2F hex (47 dec), corresponding to the "forward slash" character, that is interpreted as a header for command sequences (the double slash sequence is used to print the slash character).

Assuming that no remapping of the character codes is performed, the 96 characters from **SPACE** (20 hex, 32 dec) to **DEL** (7F hex, 127 dec), corresponding to the standard ASCII codes, are mapped in the EPROM fonts, while the 128 characters from 80 hex (128 dec) to FF hex (255 dec), corresponding to the extended ASCII codes, are mapped in the RAM fonts.

There are 32 additional positions available in the EPROM fonts (128 characters per font size in total), corresponding to the ASCII control codes, that are only accessible through the **/S** command or by remapping them to other codes through the **/Y** command.

Characters mapped in RAM fonts are user-defined: they are initially blank and can be used only after their dot patterns have been downloaded from external computer

or from a macro stored on EPROM (or disk), through the **/D** command.

A specific command (**/T**) is also available to access characters mapped in RAM fonts through standard ASCII codes, in case the external computer cannot handle extended ASCII codes.

Some fonts (small, normal, big, symbols) contain a total of 256 characters each (128 mapped in EPROM and 128 in RAM). The “pictures” font contains only 20 characters (10 in EPROM and 10 in RAM), corresponding to the numeric ASCII characters (codes 30 to 39 hex, 48 to 57 dec) and to the extended ASCII codes B0 to B9 hex (176 to 185 dec). The “magnum” and “mega” fonts contain only 128 characters, mapped in RAM, that can be accessed either through standard or extended ASCII code.

Characters are drawn in the printable area (640 or 896 dots wide, depending on the printhead used, and 2300 dots high) at the current cursor position, taking as a reference point the lower left corner of upper case characters for the “small”, “normal”, “big”, “magnum” and “mega” fonts, or the lower left corner of the matrix for “symbols” and “pictures” fonts).

Character size, orientation and drawing mode depend on the current values of the parameters controlled by the **/F** and **/R** commands.

If part of the character goes out of the printable area it is either truncated (top or bottom) or wrapped around to the other side (left or right).

After drawing, the cursor is automatically moved in the appropriate direction (according to the selected print orientation) of an amount determined by the the “pitch” parameter, that has a default value for every font size and that can be altered through the **/X** command.

Character spacing is the same for all characters in case of EPROM fonts (fixed spacing), but it can be different for every character in case of RAM fonts (proportional spacing) if the appropriate character width tables are loaded through the **/D** command.

Note: see the description of the above mentioned commands and the section dedicated to the font EPROM for additional details about fonts and their structure.

SLASH SEQUENCES

//

The // command allows printout of the “slash” character.

Note: the “slash” character code is interpreted as a command header only when the machine is normally processing commands and printable characters. When the printer is processing characters from the external computer to fill a barcode string (if applicable) or variable text field (created with a **/I2** command), the “slash” is interpreted as a printable character and thus it should not be sent twice.

/!

The **/!** command allows to perform a single cut or application cycle without moving the paper, if the printer is equipped with the optional cutter or label applicator.

/#

The **/#** command allows to eject a blank label (or a predefined amount of paper) without affecting the current contents of the memory. From the point of view of paper movement, it is equivalent to a sequence **/C/W0001**, but it does not clear the memory, thus allowing to resume printing without resending the whole label a second time.

/@

The /@ command resets all internal counters associated to variable data (if any) to their initial value. It must be used, if multiple printouts of the same label (containing variable data with update step greater than 1) are required and it must be placed immediately before the second and subsequent **/Wnnnn** commands.

/$&%nnnnnnnnnnnnnnnn

The **/$&%** command stores into the non-volatile memory the current values of several parameters and allows selective locking of the functions available through the front panel of the machine and configuration of some operation modes.

It must be followed by 16 numeric characters (only “0” and “1” are allowed), each of which controls one of the functions (0=enable, 1=disable), in the following order:

I	label calibration (SET-UP mode)
II	print energy/speed adjustment (SET-UP mode)
III	operation mode setting (SET-UP mode)
IV	baud rate selection (SET-UP mode)
V	character map selection (SET-UP mode)
VI	left margin adjustment (SET-UP mode)
VII	direct/transfer selection (OFF-LINE mode)
VIII	ribbon economization (OFF-LINE mode)
IX	macro selection (OFF-LINE mode)
X	reset label counter (OFF-LINE mode)
XI	print copy of last label (OFF-LINE mode)
XII	print “status label” at power-on
XIII	alternate access to SET-UP (OFF-LINE mode)
XIV	receive data during print (ON-LINE mode)
XV	return messages and recognition of Form Feed (ON-LINE mode)
XVI	currently not used

The following parameters are stored into the non- volatile memory through this command:

front panel and functions locks (**/$&%**)
operation modes (**/K**)
print speed and energy (**/J** and **/V**)
label photosensor sensitivity (**/P**)
label offset and origin (**/H** and **/G**)
cutter/applicator parameters (**/N**)
baud rate, character map and network address

The contents of the non-volatile memory are used as default values when the machine is switched on and most of them can be altered by the operator through the front panel in SET-UP mode (to change defaults) or through the appropriate commands from external computer (temporary setting unless “frozen” by this command).

Note: the non-volatile memory uses EEPROM technology and is guaranteed to stand several thousands of programming cycles, however, to avoid exceeding this number in a short time, care should be taken to use this command only when effectively necessary.

/Awrc

The **/A** command sets the attributes of the barcode: thickness of the bars and presence/absence of human readable characters and guard bar.

It must be followed by three parameters, each consisting of a single digit, having the following meaning:

w width of the narrow element in dots, equivalent to 1/6 or 1/8 of mm depending on the printhead used (allowed values: 1 to 8)

r width ratio between the wide and narrow elements of the barcode, meaningful only for Code 39, Interleaved 2/5 and Codabar (allowed values: 1 = ratio 2:1, 2 = ratio 2.5:1, 3 = ratio 3:1)

c flag for the presence of the characters under the bars and for the presence of the guard bar on top of the bars, according to the following table:

c value	characters	guard bar
0	no	no
1	yes	no
2	no	yes
3	yes	yes

These settings are temporary and they are lost when the machine is switched off.

If the characters under the barcode are enabled, the font used to print them depends on the bar width parameter: if **w**=1 then the small font is used, if **w**=2 or 3 then normal font, if **w**=4, 5, 6, 7 or 8 then big font. Expansion factors are both set to 1.

/Bthhhc..ce

The **/B** command inserts a barcode placed with its upper left corner in the position set with the last **/E** command and according to the direction set with the last **/R** command.

It must be followed by two parameters, then by the string to be encoded and finally by a terminator, as follows:

t type of the barcode, one digit, allowed values are the following:

0	EAN13
1	EAN8
2	UPC-A
3	CODE39
4	INTERLEAVED 2/5
5	CODABAR
6,7	ADD-ON for EAN/UPC (2 and 5 digits respectively)
A,B,C	CODE128, character sets A, B and C respectively
a,b,c	EAN128, character sets A, B and C respectively

hhh height of the bars expressed in dots, equivalent to 1/6 or 1/8 of mm depending on the printhead used, three digits (allowed values: 008 to 999)

c..c character string to be encoded, variable length (1 to 40 characters) according to the rules of the selected barcode type (all characters valid for the selected barcode type are accepted: the first invalid character acts as a terminator)

e terminator of the string: it may be any character that is invalid for the selected barcode type (typically a Carriage Return, except for CODE128/EAN128 set A, where the CR is a valid character).

The following is a short description of the rules that apply to the different types of barcode available:

EAN13 Valid characters are the 10 digits (**0** to **9**). If 12 digits are entered, the checksum is calculated and placed in 13th position. If 13 digits are entered, the checksum is cross-checked with the 13th digit and the code is printed only if they match. If any other number of digits is entered, the barcode is not printed.

EAN8 Same rules as EAN13, but with 7 or 8 digits.

UPCA Same rules as EAN13, but with 11 or 12 digits.

CODE39 Valid characters are the 26 upper case letters (**A** to **Z**), the 10 digits (**0** to **9**), the **space** and the following other characters: **- . $ / + % * @** The asterisk (*****) is used as delimiter of the string and should be placed either at its beginning (start character) and at its end (stop character). However the code is printed even if the asterisk is omitted, because some special applications may require a code without delimiters. The "at" symbol (**@**) is used to indicate the modulo-43 checksum and, if required, it should be placed at the end of the string, immediately before the ending delimiter. The maximum length of the string is limited to 40 characters.

INT.2/5 Valid characters are the 10 digits (**0** to **9**). Due to the structure of this barcode, only an even number of digits (2 to 40) can be encoded. If an odd number of digits is entered, then an extra digit is automatically added at the end, representing a checksum calculated according to the ITF rules. Appropriate delimiters are automatically placed at the beginning and at the end of the string.

CODABAR Valid characters are the 10 digits (**0** to **9**) and the following other characters: **A B C D a b c d t n * e $ + - . / :**
The first three groups of four characters are normally used as delimiters and produce the same encodation (i.e.: **A**=**a**=**t**, **B**=**b**=**n**, etc.), however the code is printed even without any start and/or stop character. The last group of 6 characters may be used for including additional non-numeric information into the string, whose maximum length is 40 characters. No checksum calculation is performed.

ADD-ON These codes can only be used in combination with EAN-13, EAN-8 or UPC-A and allow to extend the number of digits encoded in the main symbol by 2 or 5 digits. The ADD-ON must always be placed to the right of the main symbol, leaving the appropriate space between them, so that the scanner will decode the combination of the two. Valid characters are the 10 digits (**0** to **9**). A check digit is automatically added and placed in the barcode, but it does not take space and it is not displayed.

CODE128 This code has a rather complex structure and recognizes three different character sets, allowing to encode the entire set of 128 ASCII characters: **set A** includes ASCII codes from 0 to 95, **set B** includes ASCII codes from 32 to 127, while **set C** allows double density encodation of numeric characters (a pair of digits is treated as a single character). The maximum string length is 40 characters. Delimiters (start and stop character) and checksum are automatically placed in the barcode, being integral part of its structure. The printer recognizes also some other special function codes, that are not part of the ASCII character set, sometimes used to instruct the reader to perform set switching and other actions:

extended ASCII code	function
128	FNC 3
129	FNC 2
130	SHIFT
131	SET C
132	SET B
133	SET A

EAN128 This is a variation of the CODE128, following exactly the same rules described above. The difference consists in the automatic placement of a special function code (FNC1) immediately after the start character: this means that the EAN128 is always a little bit longer than an equivalent CODE128.

/C

The **/C** command clears the printing area, removing all variable fields and resetting the following parameters to their default value:

font = normal
source = EPROM (fixed spacing)
horizontal expansion = 1
vertical expansion = 1
interline = 20
pitch = 12
horizontal cursor position = 0
vertical cursor position = 14
rotation = 0
mode = 0 (black)
barcode thickness = 2
barcode ratio = 2 (2.5 to 1)
barcode string/guard = 1 (string present, guard bar absent)

This command should be normally placed at the beginning of any label formatting command sequence, to prepare a white background on which to draw all the elements composing the label.

/Dfpppd..d
/Dfppplllld..d

The **/D** command allows downloading of the contents of a character matrix for one of the 128 (10 for pictures font) positions of a RAM font, or the contents of its character spacing table.

It must be followed by two or three parameters and then by the appropriate number of data bytes, as follows:

f font identifier, single digit (allowed values: 0=small, 1=normal, 2=big, 3=symbols, 4=pictures, 5=magnum, 6=mega);

ppp position of the matrix in the font, three digits, representing the decimal value of the extended ASCII code used to access that character, assuming no remapping (allowed values: 128 to 255 for all fonts except the pictures font that accepts only 176 to 185, 999 is a special value identifying the character spacing table);

lll this parameter applies only to the magnum and mega fonts (it must be omitted for the other ones) and indicates the number of data bytes that follow: this number may vary because these two fonts support data compression to reduce the amount of memory space and download time required. If **lll**=000 then the number of bytes defaults to the maximum for that font.

d..d data bytes representing the dot patterns used to build up the character matrix (9 bytes for the small font, 36 for the normal, 108 for the big, 128 for the symbols, 1600 for the pictures, up to 490 for the magnum and up to 1440 for the mega). In the special case of character code 999, the data bytes represent the default spacing, in dots, for the characters of that RAM font (always 128 bytes for any font).

The character matrixes defined with this command are temporary and they are lost when the machine is switched off.

The amount of memory reserved to store RAM fonts is 64 Kbytes, allocated as follows:

1152 bytes for the small font
4608 bytes for the normal font
13824 bytes for the big font
16384 bytes for the symbols font
16000 bytes for the pictures font

The remaining 13568 bytes are allocated dynamically on a character-by-character basis, starting from the top, to store the magnum and mega fonts. The memory size required for these two fonts varies according to the number of characters dowloaded and to their average size and complexity, due to the data compression technique adopted for them. In case that a full set of 128 characters is downloaded for both fonts, the pictures, symbols and, possibly, part of the big RAM fonts may be overlapped and thus they could not be used at the same time with the magnum and mega fonts. Furthermore, when a magnum or mega font is downloaded a second time to use a different font style, the space previously occupied is not automatically released: previous fonts must be explicitly unloaded by using the **/Y** command (see).

Note: see the section describing the structure of the EPROM fonts for further details about bit and byte mapping within the character matrix.

/Exxxxyyyy

The **/E** command sets the position of the cursor, that will be used as a reference for subsequent drawing of any object in the bitmap.

It must be followed by two parameters, each consisting of 4 digits, having the following meaning:

xxxx horizontal position in dots (allowed values: 0000 to 0639 or 0000 to 0895 depending on the printhead used);

yyyy vertical position in dots (allowed values: 0000 to 2299).

This setting is temporary and it is lost when the machine is switched off.

Note: the upper limits mentioned above are valid only in case that the origin is set

to the upper left corner of the available printing space (both origin coordinates at

0000), otherwise they must be decreased of the amount assigned to the corresponding coordinate of the origin.

/Ffhv

The **/F** command selects font and size of the characters drawn in the bitmap after it has been issued.

It must be followed by three single digit parameters identifying the desired font and the associated expansion factors, according to the following:

f font identifier, (allowed values: 0=small, 1=normal, 2=big, 3=symbols, 4=pictures, 5=magnum, 6=mega);

h horizontal expansion factor (allowed values: 1 to 9, see note);

v vertical expansion factor (allowed values: 1 to 9, see note).

These selections are temporary and they are lost when the machine is switched off.

The following table shows the geometric characteristics of the fonts (all values are in dots):

Font identifier	0	1	2	3	4	5	6
Matrix width	8	16	24	32	160	56	96
Matrix height	9	18	36	32	80	70	120
Character width	5	10	20	n.a.	n.a.	39	67
Character height	7	14	28	n.a.	n.a.	52	72
Default pitch	6	12	24	32	160	56	96
Default interline	10	20	40	32	80	70	100

Actual size in millimeters of the printed characters can be obtained by multiplying the given character sizes (typically referred to the upper case letter “M”) for the selected expansion factors, then dividing by 6 or 8 according to the printhead used.

Note: expansion factors are referred to the character matrix, independently from its orientation, and a limitation is imposed on the expansion occurring in the paper width direction, where only values of 1 to 8 are correctly recognized (9 is considered as 8).

/Gxxxxyyyy

The **/G** command sets the origin of the coordinates for cursor positioning.

It must be followed by two parameters, each consisting of four digits, with the

following meaning:

xxxx horizontal position in dots (allowed values: 0000 to 0639 or 0000 to 0895 depending on the printhead used);

yyyy vertical position in dots (allowed values: 0000 to 2299).

These settings are temporary and they are lost when the machine is switched off, unless they are stored into non-volatile memory with the **/$&%** command.

Note: when this command is executed, the cursor position is reset to the new origin and all subsequent positionings with the /E command will be relative to it.

/Hnnnn

The **/H** command sets the amount of paper feed (label offset) performed after detection of the edge of a new label, if the machine is working in “label” mode, or after the last printed line, if the machine is working in “paper” mode.

It must be followed by a four-digits parameter whose unit of measure is the dot (1/6 or 1/8 of mm depending on the printhead used) and whose value should be experimentally found to obtain the desired result by increasing or decreasing the default value calculated by the machine or adjusted by the operator in SET-UP mode.

This parameter can be adjusted either to obtain the best positioning for label dispensing or for best usage of label area (allowing to print even on the first few millimeters), or simply to set the spacing between a printout and the next one when working on continuous paper.

By setting the label offset parameter, the user can override the value calculated by the printer during the label calibration (FEED key in SET-UP mode): this means that, in case several different label formats are used, once the correct offset has been defined for each of them, it is no more necessary to recalibrate the printer every time the format is changed, if the appropriate value is set with this command for every label.

This setting is temporary and it is lost when the machine is switched off, unless it is stored into non- volatile memory with the **/$&%** command.

```
/I0
/I1nv..vmqqss
/I2ssssnnc..c
/I3sssthhhc..ce
/I4ssssbbbllll
```

The **/I** command inserts a variable field starting at the current cursor position.

The single digit parameter (allowed values: 0 to 4) immediately following the **/I** command specifies the type of variable field and determines the format of the following parameters, as follows:

/I0 It does not require any further parameter and is used to insert the printing head temperature expressed in degrees centigrades (Celsius), formatted using four characters: tens, units, decimal point, tenths (**nn.n**). The printhead temperature is read before printing each label and its value is automatically updated.

/I1 It is used to insert a numerator, which is a self-modifying numeric text field, formatted using **n** numeric characters (1 digit, 1 to 6), whose starting value is **v..v** (1 to 6 digits, 0 to 999999), changing of **qq** (2 digits, 01 to 99) every **ss** labels (2 digits, 01 to 99), while **m** controls update direction (0,2=increment, 1,3=decrement) and printout of leading zeroes (0,1=printed, 2,3=blanked).

/I2 It is used to insert a “remote” text field, represented by the string **c..c**, composed of **nn** characters (2 digits, 01 to 99) that the external computer will have to send to the printer every **ssss** labels printed (4 digits, 0001 to 9999).

/I3 It is used to insert a “remote” barcode field, whose contents **c..c** will have to be sent by the external computer every **ssss** labels printed (refer to the description of the **/B** command for details about the **t**, **hhh** and **c..c** parameters).

/I3 It is used to insert a “remote” graphics field, whose contents will have to be sent by the external computer every **ssss** labels (refer to the description of the **/Q** command for details about the **bbb** and **llll** parameters).

There is the possibility to insert up to 99 of these variable fields in a label, intermixed in any way.

These settings are temporary and they are lost when the machine is switched off.

If variable fields defined as “remote” (**/I2**, **/I3** and **/I4**) have been included in the label, the external computer, immediately after having issued the print command, must send the actual contents of these fields, formatted according to the specified length or size parameters, exactly in the same order in which they were entered in the label and following the sequence determined by their respective update step and avoiding to include any extra character (separators, CR+LF sequences, etc.).

Remember, however, that barcode field strings must always be terminated with an extra character, as they would normally be in the **/B** command.

The printer remains waiting for data from the external computer (contents of variable fields cannot be included in a “macro”) and prints a label only when all required characters (or bytes) have been received.

The computer may even send the complete set of variable data needed for a whole print batch in one shot, as they are automatically buffered by the printer and fetched when needed, at a rate determined by the print speed: this means that the computer does not necessarily have to remain busy feeding the printer for the whole duration of the print batch (unless the total size of the variable data largely exceeds the buffer size). In this case, however, is necessary to take all the precautions to avoid potential interferences due to characters sent while printing is in progress (see the description of the **/V** command for further details).

Note: in case of variable text fields (**/I2**), the BackSpace control character (ASCII code 8) is also recognized to allow printing of accented lower case letters not included in the fonts with the sequence: accent+BS+letter (this 3-characters sequence counts for just 1 character in the length of the field).

/Jhhss

The **/J** command sets the printhead and stepper motor duty cycles, that influence print speed, print quality and compression or expansion of the printed text in the paper feed direction.

It must be followed by two parameter, each consisting of two digits, having the following meaning:

hh printhead cycle period expressed in clock pulses (allowed values: 09 to 63);

ss paper feed stepping period expressed in clock pulses (allowed values: 03 to 99);

The duration of the clock pulses is determined by the first 2 parameters of the **/V** command, respectively for normal printing and for fast feeding over blank areas.

The **hh** parameter represents the total number of clock pulses that make up one printhead cycle, including loading, heating and cooling phases, while the third parameter of the **/V** command controls the duration of the heating phase only.

Paper feed speed is inversely proportional to the **ss** parameter and the aspect ratio (compression or expansion in the paper feed direction) is determined by the ratio of **hh** over **ss**, that should be about 3 for the 6 dots/mm printhead and about 2.15 for the 8 dots/mm one to allow square boxes really look square when printed. Different ratios may be used in special cases to obtain a compressed or expanded printout (useful to adjust barcode densities to match given values when printing barcodes rotated at 90º or 270º).

The following table lists the paper speeds (in mm/s) corresponding to the lowest values of the **ss** parameter for all the possible values of the clock speed (first and second parameter of the **/V** command):

	ss	03	04	05	06	07	08	09	10	11	12	13
clock	04	98	73	58	49	42	36	32	29	26	24	22
	05	130	97	78	65	55	49	43	39	35	32	30
	06	162	121	97	81	69	61	54	49	44	40	37
	07	194	146	116	97	83	73	65	58	53	49	45
	08	216	162	129	108	92	81	72	65	59	54	50
	09	242	182	146	121	104	91	81	73	66	61	56
	10	278	208	166	139	119	104	92	83	76	69	64
	11	298	224	179	149	128	112	99	90	81	75	69

These settings are temporary and they are lost when the machine is switched off, unless they are stored into non-volatile memory with the **/$&%** command.

/Kpdet

The **/K** command defines the operation mode of the printer.

It must be followed by four single digit parameters, having the following meaning:

p paper/label feed mode selection (allowed values: 0 = continuous paper, 1 = die-cut labels or punched tags, 3=labels or tags with black marks);

d label dispensing photodetector (allowed values: 0 to 7, see table)

e ribbon economization (allowed values: 0 = disable, 1 = enable);

t direct thermal/thermal transfer selection (allowed values: 0 = direct thermal, 1 = thermal transfer).

When the direct/transfer selection is changed, the appropriate set of speed-energy parameters is automatically retrieved from the non-volatile memory, overwriting the current values of the **/J** and **/V** parameters. If the printing power varies from previous setting, a delay of about 3 seconds is inserted to recalculate an internal table.

The ribbon presence photosensor is automatically disabled when the direct thermal print mode is selected.

The **d** parameter controls operation of the optional label dispensing photosensor, which allows to start printout of the next label in a printing session only when the previous one has been removed. The photodispenser signal may alternatively be generated by an external device if the machine is equipped with the optional interface connector (usually when the printer is integrated in the label applicator). In either case, the following table shows the possible values of **d** and their meaning:

d value	dispenser	check	polarity
0	disabled	disabled	active low
1	enabled	disabled	active low
2	disabled	enabled	active low
3	enabled	enabled	active low
4	disabled	disabled	active high
5	enabled	disabled	active high
6	disabled	enabled	active high
7	enabled	enabled	active high

When the photodispenser is installed, the additional check may be enabled to ensure that the label has been correctly peeled off the support paper and stands in front of the photosensor before being removed, while the polarity may be selected according to the type of photosensor mounted on the machine.

When the pneumatic label applicator is installed, the label dispensing signal is usually generated by an external photosensor mounted on the conveyor line, detecting the transit of the package to be labeled. In this case, dispenser disabled means that the signal directly triggers the air blow, the piston being already out in application position with a printed label, while dispenser enabled means that the signal triggers the printout of the label, that is then immediately applied. If the check is enabled, the printer verifies that the signal has changed state before proceeding with the next label, stopping operation and generating an error message if the previous package is still present or the next one arrives too early.

These settings are temporary and they are lost when the machine is switched off, unless they are stored into non-volatile memory with the **/$&%** command.

Note: when ribbon economization is enabled, the rewinder must be in operation (either the internal rewinder or the optional external one), otherwise paper feed cannot be performed, because the print head is raised to stop the ribbon.

/Ldlllltt

The **/L** command allows drawing of line segments, starting from the current position of the cursor.

It must be followed by three parameters, having the following meaning:

d direction in which the segment will be drawn, one digit (allowed values: 0=right, 1=down, 2=left, 3=up);

llll length of the segment in dots, four digits (allowed values: 0008 to the distance from the border in the selected direction, max 0640 or 0896 horizontal, depending on the printhead used, and 2300 vertical);

tt thickness of the segment in dots, two digits (allowed values: 01 to 99).

The direction parameter of this command overrides the currently selected print rotation (first parameter of the **/R** command), while the color of the lines drawn

depends on the current drawing mode (second parameter of the **/R** command): if mode=0 then color is black, if mode=1 then color is white, if mode=3 then color is the opposite of that of the background.

Note: the cursor position is updated to the opposite corner of the segment, to allow easy drawing of complex shapes without having to reposition it each time.

/Mwwwwhhhhttt

The **/M** command allows drawing of rectangular "boxes", with the upper left corner in the position set by the last **/E** command.

It must be followed by three parameters, having the following meaning:

wwww width of the box in the paper width direction, four digits (allowed values: 0008 to the distance from the right border, max 0640 or 0896 dots, depending on the printhead used);

hhhh height of the box in the paper feed direction, four digits (allowed values: 0008 to the distance from the bottom border, max 2300 dots);

ttt thickness of the box sides, measured towards the center, three digits (allowed values: 001 to 999).

The currently selected print orientation (first parameter of the **/R** command) is ignored, but the drawing mode (second parameter of the **/R** command) follows the rules already described for the **/L** command.

/Nssssoooo

The **/N** command sets the mode of operation of the cutting device or the label applicator that may be optionally installed on the machine.

It must be followed by two 4-digits parameters, having the following meaning:

ssss cutting step or applicator times (allowed values: -999 to -111 and 0000 to 9999)

oooo back feeding offset (reserved for future use)

If **ssss**=0000 the cutter (or the applicator) is disabled.

Positive values enable the cutter and define the number of labels printed before the next cut is performed.

Negative values enable the applicator and define the delay times to allow the piston

to move down (second digit) or up (third digit), while the first digit (the one immediately after the minus sign) represents the scaling factor expressed in tenths of second (i.e. -168 and -234 both mean 0.6s for piston down and 0.8s for piston up).

These settings are temporary and they are lost when the machine is switched off, unless they are permanently stored in non-volatile memory through the **/$&%** command.

/Onnnn

The **/O** command sets the amount of white space in the paper feed direction above which speed optimization and (if enabled) ribbon economization will be performed.

It must be followed by a four-digits parameter representing the number of contiguous blank dot lines (allowed values: 0032 to 9999).

This setting is temporary and it is lost when the machine is switched off.

By default, a value corresponding to about 4 mm (0026 for the 6 dots/mm printhead and 0032 for the 8 dots/mm one) is assumed when the machine is switched on or when the **/Z** command is issued. This distance is the minimum amount of paper/ribbon feed necessary to bring the last printed line out of the printhead to allow the ribbon to detach from the paper, thus avoiding possible jams due to the ribbon remaining stuck on the paper.

/Psss

The **/P** command allows to set the sensitivity value of the label photosensor to correctly detect the gap between labels, or the notch, black mark or other variation in opaqueness that may be used to keep the paper feed mechanism synchronized with a predefined step.

It must be followed by a three digit parameter that represents the threshold level at which the photosensor circuit switches (allowed values: 000 to 255, each unit represents approximately 20 mV measured at the output of the photosensor).

The label gap photosensor works by detecting the amount of infrared light passing through the material (it is not a reflective device) and transforms it in a voltage ranging from 0 (opaque like metal) to 5 volts (transparent like air).

Reliable detection of the gap requires that the signal change (contrast) due to the gap itself is greater than the signal change due to optical dishomogeneities of the labels (specially if they are preprinted) or of the backing paper.

The label calibration procedure (activated by pressing the FEED key in SET-UP mode) attempts to automatically find the correct value of the switching threshold by measuring the transparence of the label and assuming that the backing paper gives

a signal which is at least 1.5 times + 400 mV greater (or that the black mark gives a signal less than half). Although these assumptions are valid in the majority of cases, there are special situations in which this is not true and the automatic calibration procedure fails or gives erratic label positioning (typically in case of preprinted labels or when there is very little contrast between the label and the backing paper).

When the automatic calibration cannot find a valid value for the **sss** parameter, then it is possible to force it using the **/P** command, generally decreasing the calculated value to compensate for a reduced contrast (thick/dark silicon papers or thin/clear labels). Remember however that in extreme cases (i.e. transparent labels) there is not enough contrast and thus the signal must be generated by a black mark that may be printed on the rear side of the backing paper.

This setting is temporary and it is lost when the machine is switched off, unless it is stored into the non-volatile memory through the **/$&%** command.

/Qbbbllllg..g

The **/Q** command allows download of a rectangular block of bit-mapped graphics and to insert it with its upper left corner at the position set by the last **/E** command.

It must be followed by two parameters defining the size of the bit-map and then by the binary data representing its contents, as follows:

bbb number of bytes (groups of 8 adjacent dots) that compose every single line of the bit-map, three digits (allowed values: 001 to 080 or 001 to 112 depending on the printhead used);

llll number of dot lines that compose the graphics block, four digits (allowed values: 0001 to 2300).

g..g stream of **bbb** x **llll** bytes that define the bit-map, formatted in a way similar to downloaded fonts: every bit represent a single dot (1=printed, 0=blank, MSB left, LSB right), bytes in a line are ordered from left to right and lines are ordered from top to bottom.

An alternative format for this command allows download of graphics data expressed in hexadecimal notation instead than in binary one (slower but useful when the external computer cannot handle 8-bit binary data): in this case the **bbb** parameter must be negative (-01 to -99), a CR+LF sequence must follow the **llll** parameter and then the specified number of lines must follow, each composed of the specified number of hex character pairs expressing the value of the bytes and terminated with a CR+LF sequence.

The block is automatically truncated if it exceeds the right and/or the bottom margin of the printable area.

Parameters of the **/R** command (rotation and print mode) are ignored in case of

graphics blocks, that are always printed with rotation 0 (none) and mode 2 (reverse): this means that, if rotation of the picture is required, it must be performed externally, before downloading of the graphics data to the ST230 and that, if the graphics block is overprinted on an existing black background (i.e. a “filled box” created with a previously issued **/M** command), the image appears in “reverse” like a photographic negative.

/Roc

The **/R** command sets the orientation and the color in which subsequent characters, barcodes and lines/boxes will be drawn.

It must be followed by two single digit parameters having the following meaning:

o orientation (allowed values: 0 = normal, 1 = 90° clockwise rotation, 2 = 180° cw rotation, 3 = 270° cw rotation);

c drawing color with respect to the existing background (allowed values: 0=black, 1=white, 2=reverse).

Rotation and color are ignored when printing bit-mapped graphics with the **/Q** command (in this case no rotation and reverse are assumed); rotation set by the **o** parameter is also ignored by the box (**/M**) and line (**/L**) commands.

Color 0 (black) should be used in normal cases where black items must be printed on a white background. Color 2 (reverse) should be used when white items must be printed on a black background: in this case the background must be previously created (for example, the **/M** command may be used to draw a solid box). Color 1 (white) should be used only in special cases when drawing white lines on black backgrounds, to avoid the problems existing at the intersections if color 2 is used.

These settings are temporary and they are lost when the machine is switched off.

/Sc

The **/S** command is used to print the characters/symbols located in the first 32 positions of a font, corresponding to the ASCII control codes. These symbols are taken from EPROM (positions 0 to 31) except when magnum or mega fonts are selected or the **/T1** command was issued, in which case they are taken from RAM (positions 128 to 159).

It must be followed by a single character parameter that can be any standard ASCII code, whose binary value is masked to leave only the five least significant bits, thus allowing access to the first 32 positions of the active half of the selected font.

An alternative way to access the first 32 position of the fonts is to remap them on extended ASCII codes by selecting one of the international character maps (typically the IBM map, which is also set by default from factory) or by defining a custom map by means of the **/Y** command.

/Tn

The **/T** command swaps RAM fonts and EPROM fonts, allowing either access to user-defined characters (RAM fonts) through standard ASCII codes or fast switching between a “standard” and an “alternate” font, depending on how RAM fonts are managed.

It must be followed by a single digit parameter that can be 0 (standard ASCII codes access EPROM fonts and extended ASCII codes access RAM fonts) or 1 (viceversa).

When swapping is activated (**/T1** has been issued), the character position, obtained after translation of the received ASCII character code through the current character map, is altered by inverting its most significant bit (XORed with 80hex, 128dec), thus exchanging the upper and lower 128 positions of the fonts (respectively the RAM and EPROM based portion of the fonts).

The command acts at the same time on all font sizes and is temporary, its effect being lost when the machine is switched off.

Note: this command is ignored when the magnum or mega font is selected, because these fonts are only based in RAM (they have no EPROM counterpart, unlike the others). In this case the characters may be accessed either through standard or extended ASCII codes.

/Ummm
/Uddfffffffff

The **/U** command is used to execute a predefined sequence of commands (a “macro” command) stored in EPROM or on disk (if the printer is equipped with disk interface).

It must be followed by a 2-characters parameter that, depending on its value, may be followed by a further 8-characters parameter, having the following meaning:

mm macro number, 2 digits (allowed values: 00 to 99). If 00 is selected, then the “status label” is printed, else the corresponding macro located in the dedicated macro EPROM is executed (if it exists).

dd disk drive identifier, 2 characters (allowed values: A: or B:). Disk “A:”

refers to the internal ROM disk located in the program EPROMs, that

contains some factory-defined macros. Disk “B:” refers to the diskette currently present in the disk drive (assuming the machine is equipped with the optional disk drive and interface card).

f..f macro name, 8 characters (allowed values: any valid DOS file name, with no extension). Of course, only names corresponding to existing files in the selected drive will be considered valid, otherwise no action is performed. If the disk file name is shorter than 8 characters, the macro name must be left-justified and right-padded with blanks.

Macro number 99, if present in the macro EPROM, is automatically executed when the machine is switched on, just after having printed the “status label” (if enabled) and before entering the ON-LINE mode: it may be typically used to fill RAM fonts with predefined custom fonts, so that they are immediately available with no need to download them from serial line.

/Vssffeppp

The **/V** command allows set-up of parameters controlling the internal print clock speed and the nominal amount of energy (black level) used during print.

It must be followed by four parameters having the following meaning:

ss standard clock speed used during print, two digits (allowed values: 04 to 08, see table);

ff fast clock speed used when skipping over white spaces, two digits (allowed values: 02 to 11, see table);

e energy level of the printhead, one digit (allowed values: 3 to 7 for the 6 dots/mm printhead, 2 to 6 for the 8 dots/mm): it represents the number of clock pulses per cycle in which the printhead is activated and allows coarse setting of the black level;

ppp power level of the printhead in milliwatts, three digits (allowed values: 550 to 850 for the 6 dots/mm printhead, 400 to 700 for the 8 dots/mm): it determines the nominal printhead driving voltage at 25º C and allows fine setting of the black level.

The **ss** and **ff** parameters come with a default factory setting of 05 and 06 respectively. Changing these values requires some experience and knowledge about the possible limitations and risks concerned. Their effect is to change the internal print clock speed, and thus the width of clock pulses, according to the following table:

ss or **ff** value:	02	03	04	05	06	07	08	09	10	11
pulse width (µs):	400	300	200	150	120	100	90	80	70	65

The printhead cycle time (the time it takes to print one single line of dots) is obtained by multiplying the pulse width by the first parameter of the **/J** command; the printhead pulse duration is obtained by multiplying the pulse width by the **e** parameter.

By setting the **ss** and **ff** parameters at values higher than the default ones, it is possible to print at higher speeds, if some degradation of print quality can be tolerated, but this has an important side effect: if data are sent to the machine while it is printing, there is an interference (more or less visible depending on print speed and data rate) consisting in the elongation in the paper feed direction and partial truncation of the printed text. This is due to the limited processing power of the internal microprocessor and to the choice of giving priority to the serial line, in order to avoid loss of data, even in the worst case.

For the above mentioned reason, it is advisable to limit the clock speed to safe values (4 to 5 for print and 5 to 6 for fast feed) and avoid high baud rates when the machine is used in spooling mode or when “remote” variable fields are present, possibly using the lowest values for the **/J** parameters in order to partially recover print speed.

An alternative way to avoid this problem is to configure the printer so that it sets the line busy during the printing phase (see the **/$&%** command), provided that the external device sending data to the machine quickly stops transmission as soon as the RTS line goes high and the XOFF is emitted.

These settings are temporary and they are lost when the machine is switched off, unless they are stored into non-volatile memory with the **/$&%** command.

/Wnnnn

The **/W** command starts the printout of a number of labels specified by the four-digits parameter **nnnn**, ranging from 0001 to 9999.

During printing, the machine cannot process further commands, but is able to receive and store them into a buffer, until it gets full (64 Kbytes max): new commands will be processed as soon as the printing session is completed and the printer is back ON-LINE. See the description of the **/V** command for details about speed limitations when sending data while the machine is printing.

The printing session can be suspended at the end of the current label by pressing the “ON LINE” key and then restarted by pressing the same key again. Abortion is possible, after suspension, with the key-sequence: HEAD LIFT, FEED, HEAD LIFT, ON LINE.

There is also the possibility to suspend or to abort a printing session, at the end of the current label, from the external computer using respectively the character sequence: **DLE US US NAK** (codes 10 1F 1F 15 hex, 16 31 31 21 dec) or **SI US US NAK** (codes 0F 1F 1F 15 hex, 15 31 31 21 dec).

/Xiiippp

The **/X** command is used to change the value of the “interline”, that is the amount the cursor is moved down (with respect to the current printing direction) every time the **LF** command is issued and the value of the “pitch”, that is the amount the cursor is moved right (with respect to the currently selected printing direction) every time a new character is entered.

It must be followed by two parameters, each consisting of three digits, with the following meaning:

iii interline change, measured in dots (allowed values: -99 to 999);

ppp pitch change, measured in dots (allowed values: -99 to 999).

Interline and pitch are set to default values every time a font is selected, according to the character size (see the description of the **/F** command) and they can be subsequently modified through this command, by adding or subtracting the desired number of dots.

The pitch correction works either for fixed spacing fonts and for proportional spacing ones.

These settings are temporary and they are lost when the machine is switched off, furthermore, they are reset to default values every time the **/F** command is issued to change the font.

Note: the values entered with this command are automatically multiplied by the horizontal and vertical expansion factors set by the last font selection command.

/Yb..b

The **/Y** command is used to download a user-defined character map that replaces the default map or the language dependent map selected during printer SET-UP. It is also used to release the memory area used by the magnum and mega fonts.

It must be followed by 256 binary values (codes from 00 to FF hex, 0 to 255 dec) that define the correspondence between the ASCII codes of printable characters and the physical position of the associated dot matrix in the font. The character map is common for all fonts.

This setting is temporary and it is lost when the machine is switched off.

Note: see the section concerning the structure of the font EPROM for further details.

/Z

The **/Z** command resets the following parameters to the current set-up value stored in non-volatile memory:

label origin,
label offset,
label photosensor sensitivity,
paper/label mode,
photodispenser mode,
ribbon economization,
print mode (thermal transfer or direct thermal),
clock speed during printing and fast feed,
printhead energy and power,
printhead and stepper motor duty cycles,
cutting device parameters.

The following other parameters are reset to their default values:

barcode width = 2 (narrow elements 2 dots wide),
barcode ratio = 2 (2.5:1 for C39, I2/5, Codabar),
characters under barcode = enabled,
guard bar on top of barcode = disabled,
minimum optimization distance = 26 or 32 dots.

This command is automatically executed every time the machine is switched on.

RETURN CODES

The printer can send to the external device several messages to inform it about its status.

These messages may be sent automatically during data reception (buffer status), during command processing or printing (printer status), or they may be sent only upon request (sensors status).

The machine can be configured with the **/$&%** command to inhibit transmission of any message except those related to buffer status, to avoid undesired interferences when it is connected to a device (spooler) that does not expect to receive any data back from the printer other than XON/XOFF codes.

BUFFER STATUS

The ASCII control characters **DC1** (code 11 hex, 17 dec) and **DC3** (code 13 hex, 19 dec), better known as XON and XOFF, are sent by the machine to inform the external device about the status of the internal 64 Kbytes receive buffer, thus allowing data-flow control even without physical connection of the RTS line from the printer.

An XOFF character is sent when the RTS line goes from high to low, indicating that the receive buffer is almost full (more that 60000 bytes present) and every time any extra character is received in this condition.

An XON character is sent every time RTS goes from low to high (this happens also when the printer is switched on, after the inizialization phase), indicating that space is available in the receive buffer (less than 50000 bytes present).

The machine can go busy (RTS low, XOFF emitted) and ready (RTS high, XON emitted) also during print, respectively before and after each label is printed, and when it passes from ON-LINE to OFF-LINE and viceversa, but only if this mode has been selected by setting to 1 the 14th digit of the **/$&%** command. Another situation in which the machine goes busy is when it receives the **VT-US-US-NAK** command sequence: in this case it goes back ready as soon as the receive buffer is completely empty.

If a framing error is detected in the received data, the **BEL** character (ASCII code 7) is transmitted to inform the external device that received characters may have been lost. This generally indicates a noisy transmission line.

See the section “Connection to external devices” for further details about the status of the RTS line and the communication protocol.

SENSORS STATUS

Every time the ASCII control character **ENQ** (code 5) is processed, the printer sends a status message consisting of an upper case letter “S”, followed by five consecutive numeric characters (format **Sprdcf**), followed by a **CR/LF** sequence.

The message informs the external device about the possibility to successfully start a printing session and the meaning of the characters composing it is the following:

S header of the status message,

p status of the photosensor detecting the end of the label roll (0=normal, 1=end),

r status of the photosensor detecting the end of the thermal transfer ribbon (0=normal, 1=end),

d status of the photosensor for label dispensing (0=no label, 1=label present),

c status of the sensor detecting cover open and/or print head lifted (0=normal, 1=open/lifted),

f flag indicating the power-on status and type of printhead installed (0=first status message after power-on, 1=printhead with 6 dots/mm, 2=printhead with 8 dots/mm).

The **ENQ** is processed in real time (and thus the message is immediately sent out when **ENQ** is received) only if the printer is ON-LINE and it is not printing or processing a previous command (receive buffer empty), otherwise it is buffered and executed later, like any other command processed by the Main Command Interpreter.

PRINTER STATUS

The ASCII control characters **DC2** (code 12 hex, 18 dec) and **DC4** (code 14 hex, 20 dec) are sent by the printer every time in enters respectively the ON-LINE (also at switch-on) and OFF-LINE mode, indicating wether the machine can or cannot process commands and characters received from the external computer.

The machine switches between ON-LINE and OFF-LINE modes when the operator presses the ON LINE key on the front panel and also goes OFF-LINE when a non-recoverable error occurs during a printing session. If the 14th digit of the **/$&%** command has been set to 1, XON and XOFF characters are also sent together with **DC2** and **DC4**.

The ASCII control character **NAK** (code 15 hex, 21 dec) is sent by the printer every time the Command Interpreter processes a command containing a syntax error (wrong characters, parameters out of range, etc.), when the name of a file that does not exists is specified in the **/UA:** or **/UB:** command, or when a disk error occurs during execution of a **/UB:** command.

The ASCII control character **SYN** (code 16 hex, 22 dec) is sent by the printer every time the Command Interpreter processes a drawing command resulting in a character, line or graphics block going partially or totally out of the printing area.

The ASCII control character **ACK** (code 6) is sent by the printer when the Command Interpreter processes a print command (either a **/Wnnnn** or the **FF** control character) and indicates the start of a printing session.

Every time a label is printed, or should be printed, during a printing session, a message is sent out to indicate either the start, the end and the result of the operation. The “status label” and copies printed with the FEED key, however, do not generate any message.

The message is a string of 6 characters (format **Prnnnn**) followed by a **CR+LF** sequence (8 characters in total), where the upper case letter “P” is sent just before the paper motor starts moving and the rest of the message is sent when the printing cycle of the single label has been completed. If the cutter or the applicator are installed and enabled, the printing cycle includes their activation after the label has been printed. If, for any reason, the label has not been printed, the rest of the message immediately follows the “P”.

The four-digits field **nnnn** indicates the number of labels still remaining to be printed (value ranging from 0000 to 9999), while the single-digit field **r** indicates the result of the print operation, according to the following:

r = 0 the label has been successfully printed and the printing session continues normally, unless the label counter reaches 0000, in which case the printing session is terminated (the message **P00000** may be interpreted by the external computer as the regular completion of the print command);

r = 1 before printing the label, the photosensor has detected the end of the roll of labels: the printing session is suspended and the printer goes OFF-LINE;

r = 2 before printing the label, the photosensor has detected the end of the thermal transfer ribbon (only if the machine is working in thermal transfer mode): the printing session is suspended and the printer goes OFF-LINE;

r = 3 before printing the label, the photosensor has detected that the previous label has not yet been taken away (only if the photodispenser is enabled): the printer remains waiting and continues sending this message until the label is removed; this happens also if, instead of reading the photodispenser, the machine waits for the external START signal;

r = 4 during printing, the photodispenser has detected that the label has not been correctly dispensed (it has followed the silicon paper or it is simply missing): the printing session is suspended after completion of the current label and the printer goes OFF-LINE (this message can be generated only if the photodispenser is currently enabled with the additional dispensing check); when the applicator is installed, this message may indicate that the START signal was issued at the wrong time;

r = 5 during printing, the ON-LINE key has been pressed, indicating that a manual stop is requested, or the **DLE-US-US-NAK** command sequence has been received: the printing session is suspended at the completion of the current label and the printer goes OFF-LINE;

r = 6 before printing the label, the temperature sensor has detected an excessive temperature of the printhead (above 58°C): the printer waits a few seconds and then automatically tries to restart the printing session;

r = 7 before printing the label, the cover/open or the head/lift microswitch (that can be optionally installed on the machine) has detected that either the cover is open or the print head is not in contact with the paper (if the head was lifted using the mechanical handle): the printing session is suspended and the printer goes OFF-LINE;

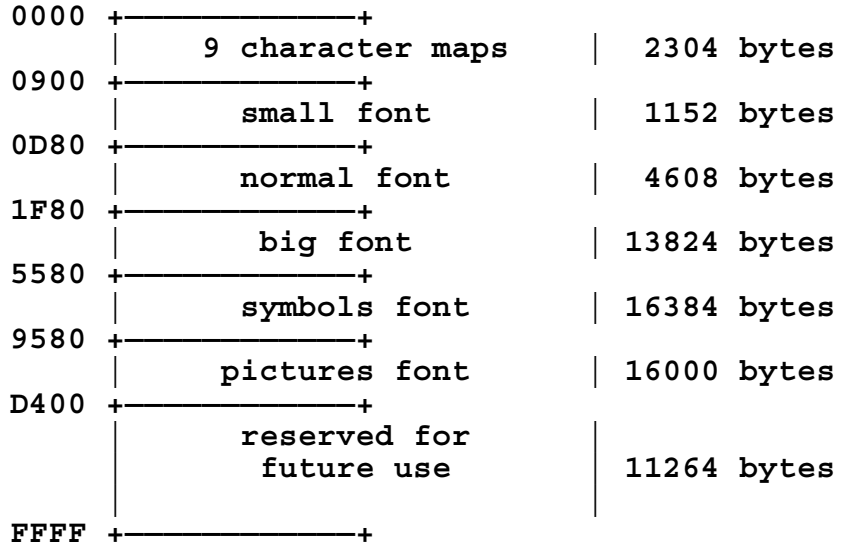
r = 8 after having printed the label, if the edge of the next one is not found within 2600 dots from the top of the previous one (about 454 mm for the 6 dots/mm printhead and 325 mm for the 8 dots/mm one), the motor stops, the END PAPER/RIB led is turned on and the printer goes OFF-LINE; this message can also be generated, when the machine is equipped with the optional cutting device, if the blade gets blocked because of a paper jam or because of excessive thickness of the material; another situation in which this error message can be sent is when the machine is equipped with the applicator and its vacuum sensor has not detected the presence of the label under the plate;

r = 9 after having printed the label, if the **SI-US-US-NAK** command sequence was received from the RS232 line, the printing session is terminated before having completed the number of labels initially requested and the machine remains ON-LINE, ready to process further commands; this message is also generated when the “abort” is manually issued with the key sequence ON LINE, HEAD LIFT, FEED, with the only difference that, in this case, the message does not start with the “P” (just the “9” followed by the four digits of the label counter is sent).

FONT EPROM

The printed circuit board of the ST230, version B, provides 4 sockets to accomodate up to 4 EPROMs: the fourth socket (the one closest to the big electrolytic capacitors of the power supply) is dedicated to the font EPROM.

The data in the font EPROM have the following structure (addresses are hexadecimal, sizes in decimal):



Each of the first 4 fonts (small, normal, big, symbols) contains 128 character matrixes, the first 32 of which are accessible through the /S command, the other 96 are directly accessible through the ASCII code of the character to be printed (provided that no remapping is performed).

The fifth font (pictures) contains only 10 matrixes, corresponding to the ASCII numeric characters “0” to “9” (codes 48 to 57 dec, 30 to 39 hex).

A font editing program (FE230) is available from Leptons Italia S.p.A. for creation of new fonts and/or customization of existing ones.

CHARACTER MAPS

To allow easy adaptation of the printer to different national languages, a set of special characters (accented letters and other symbols) is included in the standard font EPROM, located in the first 32 positions of each of the first three fonts (small, normal and big). The character maps offer 9 different alternatives for matching the physical position of any of the 128 characters of the EPROM fonts to any ASCII code, other than the straightforward 1 to 1 (used when no map is selected).

The “code-to-position” translation mechanism is based on a character map located in RAM memory, consisting of a 256 bytes table that can be redefined using the **/Y** command. The code (0 to 255 dec, 0 to FF hex) of a printable character (either a direct standard or extended ASCII code, or modified through the **/S** command) is used as a displacement in this table to fetch the effective position of the dot matrix inside the font (EPROM font if position is 0 to 127, RAM font if position is 128 to 255).

When the printer is switched on, the character map is initialized to the straightforward sequence 0 to 255 (this means that character code and its position in the font are identical and no translation is performed) if no map is selected, otherwise, if a number greater than zero has been selected in SET-UP mode (the value is permanently stored in non-volatile memory), the corresponding map is copied from the font EPROM into RAM memory and becomes the active map (it can always be mofified with the **/Y** command).

The following table shows the correspondence between character position in the font and ASCII code adopted for the 9 maps contained in the standard EPROM (for positions not listed in the table and codes marked ---, the code is equal to the position itself):

Pos.	M.1	M.2	M.3	M.4	M.5	M.6	M.7	M.8	M.9
0	91	--	91	--	--	--	142	--	--
1	92	--	92	--	--	--	153	--	--
2	93	--	94	--	--	--	154	--	--
3	--	93	93	--	--	--	143	--	--
4	--	91	--	--	--	--	146	--	--
5	--	92	--	--	--	--	157	--	--
6	--	--	64	--	--	--	144	--	--
7	126	--	--	--	--	--	225	--	--
8	--	--	--	--	--	--	165	--	--
9	123	--	123	--	--	--	132	--	--
10	124	--	124	--	--	--	148	--	--
11	124	--	126	--	--	--	129	--	--
12	--	125	125	--	--	--	134	--	--
13	--	123	--	--	--	--	145	--	--
14	--	124	--	--	--	--	155	--	--
15	--	--	--	--	--	--	135	--	--
16	--	--	--	--	--	--	168	--	--
17	--	--	--	---	--	--	164	--	--
18	--	--	--	--	--	--	133	--	--
19	--	--	--	--	--	--	138	--	--
20	--	--	--	--	--	--	151	--	--
21	--	--	--	--	--	--	141	--	--
22	--	--	--	--	--	--	128	--	--
23	--	--	--	--	--	--	140	--	--
24	--	--	--	--	--	--	149	--	--
25	--	--	96	96	123	--	248	--	--
26	--	--	--	--	--	--	130	--	--
27	--	--	--	126	--	--	161	--	--
28	--	---	--	125	--	--	230	--	--
29	--	--	--	91	--	--	173	--	--
30	--	--	--	--	--	35	156	--	--
31	--	--	--	--	--	--	232	--	--
127	--	--	--	--	--	--	176	--	--

Map 1 = German
Map 2 = Danish/Norwegian
Map 3 = Swedish/Finnish
Map 4 = Spanish
Map 5 = French
Map 7 = IBM PC
Map 8 = not used
Map 9 = not used

SMALL FONT

Each character matrix uses 9 sequential bytes: it is 1 byte wide and 9 bytes high. The upper row of dots corresponds to the first byte and so on. The leftmost dots correspond to the most significant bits, “ones” are printed dots, “zeroes” are blank dots (the typical binary representation of the bytes matches the appearance of the dots when printed). Typically an upper case character is 7 dots high and 5 dots wide and is aligned with the upper left corner of the 9 by 8 box (default horizontal spacing for this font is 6 dots) and the lower 2 dot lines are used for descenders of lower case letters.

NORMAL FONT

Each character matrix uses 36 sequential bytes: it is 2 bytes wide and 18 lines high. The byte sequence is “by row” (bytes 1 and 2 are respectively the left-hand and right-hand halfs of the upper line of dots, and so on) and bits within bytes follow the same rules as described for the small font. Typically an upper case character is 14 dots high and 10 dots wide and is aligned with the upper left corner of the 18 by 16 box (default horizontal spacing for this font is 12 dots) and the lower 4 dot lines are used for descenders of lower case letters.

BIG FONT

Each character matrix uses 108 sequential bytes: it is 3 bytes wide and 36 lines high. Byte and bit mapping as above. Typically an upper case character is 28 dots high and 20 dots wide and is aligned with the upper left corner of the 36 by 24 box (default horizontal spacing for this font is 24 dots) and the lower 8 dot lines are used for descenders of lower case letters.

SYMBOLS FONT

Each character matrix uses 128 sequential bytes: it is 4 bytes wide and 32 lines high. Byte and bit mapping as above. Typically symbols tend to be aligned to the lower left corner of the 32 by 32 box, if their size is significantly smaller than the box itself (default horizontal spacing for this font is 32 dots). Only positions 0 to 28 are currently filled with symbols in the standard EPROM, all the others are blank.

PICTURES FONT

Each character matrix uses 1600 sequential bytes: it is 20 bytes wide and 80 lines high. Byte and bit mapping as above. Default horizontal spacing for this font is 160 dots.

STANDARD FONTS EXAMPLE

Table "A" inserted at page 57 , includes standard example of fonts and symbols

MACRO EPROM

The printed circuit board of the ST230, version B, provides 4 sockets to accomodate up to 4 EPROMs: the first socket (the one closest to the quartz crystal and RS232 connector) is dedicated to the user-defined macros.

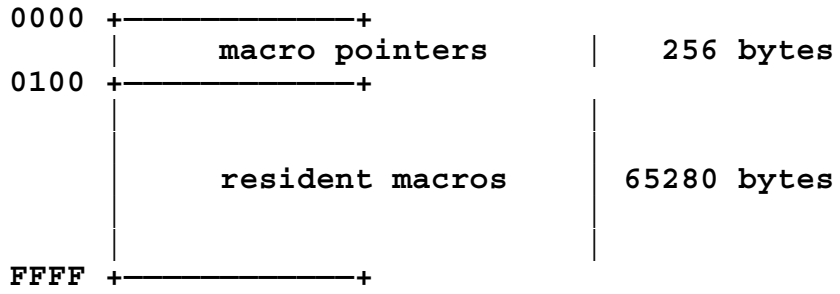
Generally speaking, a “macro”, or “macro command”, consists of a sequence of commands and/or printable characters, following exactly the same syntax previously described for commands received from external computer, that has been “frozen”

and permanently stored in the EPROM. Needless to say, macros are an extremely powerful tool to allow easy handling of demo labels, masks, logos (either by using graphics commands or by composing mosaics with pieces taken from the symbols/

pictures font), etc.

These macros may be accessed either through the /U command (when printer is ON-LINE) and through the THERM TRANSF key (when printer is OFF-LINE) after having pressed the HEAD LIFT key.

The macro EPROM has the following structure (addresses are hexadecimal, sizes in decimal):



As macros have different lengths, to let the machine know at which address in the EPROM a macro starts, a pointers table is used, holding the 99 addresses of the 99 possible macros relative to the beginning of the EPROM (2 bytes each, least significant byte first, only the first 198 of the 256 bytes available are actually used).

Every macro must be terminated with an **EOT** control character (ASCII code 4).

MACRO LINKER

To automate the creation of a customized version of the EPROM, a utility program (Macro Linker) named ML230.EXE is available upon request from Leptons Italia S.p.A., for IBM PC and compatibles, that links together all the macros supplied by the user (created using any available ASCII text editor or the dedicated Leptons label editor, LW230), automatically filling the macro pointers table and placing the EOTs at the end of each macro.

The program generates a file named ST230MAC.INT that is ready to be downloaded into any EPROM programmer compatible with the Intel data format.

Each macro must be stored in a separate ASCII file, located in the current directory of the disk and named MACRO#.230, where the parameter “#” indicates the macro number and consists of 1 or 2 ASCII digits, with no leading zeroes (for example: MACRO1.230, ..., MACRO9.230, MACRO10.230, ..., MACRO99.230).

The total number of macros is variable from 1 to 99 and they don’t need to be numbered sequentially: missing macros are automatically replaced by an empty one (a single EOT).

Macro 99, if present in the EPROM, is automatically executed every time the machine is switched-on and so it may be used for a custom initialization of the printer.

MACRO LINKER

To automate the creation of a customized version of the EPROM, a utility program (Macro Linker) named ML230.EXE is available upon request from Leptons Italia S.p.A., for IBM PC and compatibles, that links together all the macros supplied by the user (created using any available ASCII text editor or the dedicated Leptons label editor, LW230), automatically filling the macro pointers table and placing the EOTs at the end of each macro.

The program generates a file named ST230MAC.INT that is ready to be downloaded into any EPROM programmer compatible with the Intel data format.

Each macro must be stored in a separate ASCII file, located in the current directory of the disk and named MACRO#.230, where the parameter "#" indicates the macro number and consists of 1 or 2 ASCII digits, with no leading zeroes (for example: MACRO1.230, ..., MACRO9.230, MACRO10.230, ..., MACRO99.230).

The total number of macros is variable from 1 to 99 and they don't need to be numbered sequentially: missing macros are automatically replaced by an empty one (a single EOT).

Macro 99, if present in the EPROM, is automatically executed every time the machine is switched-on and so it may be used for a custom initialization of the printer.

BUILT-IN MACROS

An additional set of predefined macros is also available, containing several print samples and some proportionally spaced fonts. These macros are stored in the program EPROMs (located on the two central sockets) and can be accessed either through serial line with the **/UA:nnnnnnnn** command, where **nnnnnnnn** represents the macro name, and through front panel with the RIBBON ECONOM key in OFF-LINE/HEAD-LIFT mode. Only the 10 macros from **MACRO-A** (1 keypress) to **MACRO-J** (10 keypresses) can be executed manually, the others (proportional fonts) can only be activated by the **/U** command from external computer.

Listing of these macros are included in the following pages together with printed examples.

Macro name: **MACRO-A**

It prints two copies of a demo label that also includes the printhead temperature, using the currently set parameters. Here follow the listing and a printed sample:

```
/C
/E00800085/M03400060030
/E00800085/M03400060030
/E00000150/M05000040020
/E00000200/M02100110003
/E00000320/L0050004
/E02300320/L1013004
/E00050060/F143LEPTONS/F211 ITALIA
/E01400130/R02/F211* ST230 *
/E01050160/R01/M02920020010
/E01070177/R00/F111THERMAL TRANSFER PRINTER
/E00600225/F022STOCK no.
/E00100270/F2211770
/E00300295/F111Temp.= /I0
/E00200425/R30/F121LOT.
/E00550420/F21124
/E02400335/R00/F021PROD.CODE
/E03000450/F244A1
/E02700210/A230/R00/B3090*1770*
/E00700420/A230/R30/B413024
/W0002
```

Macro name: **MACRO-B**

It prints two copies of a simple demo label using the currently set parameters. Here follow the listing and a printed sample:

```
/C
/E00800085/M03400060030
/E00050060/R00/F212LEPTONS ITALIA S.p.A.
/E01850130/R02/F211ST230
/E00500200/A211/B3100*ASDF1234*
/W0002
```

Macro name: **MACRO-C**

It prints two copies of a demo label including a three-digit sequential number drawn with the biggest characters size available from the standard EPROM fonts, using the currently set parameters. Here follow the listing and a printed sample:

```
/C
/E00000280/F289/I1300000101
/W0002
```

Macro name: **MACRO-D**

It prints two copies of a demo label that mimics the so-called AIAG label (reduced version of the ODETTE label), used in the automotive industry, using the currently set parameters. Here follow the listing and a printed sample:

```
/D0160...binary data...    (download small font)
/C
/E00240000/M06120869002
/E04550000/L1086902
/E02850000/L1086902
/E01640000/L1086902
/E00850521/L1034902
/E04550372/L2017002
/E02850521/L2026102
/R10
/F012/T1
/E06180006PART No.
  (P)
/E04360006QUANTITY
  (Q)
/E04360378PURCHASE ORDER
     (A)
/E02670006SUPPLIER
  (V)
/E02670526ENG. CHANGE LEVEL
     (2P)
/E01450006SERIAL No.
   (S)
/E01450526DESCRIPTION
/E00670526MFG DATE
/E05640114/F232/T01234567890
/E05510046/A230/B3085*P1234567890*
/E03880086/F222123456
/E03820046/A230/B3085*Q123456*
/E03880515/F2121234567890
/E03820418/A230/B3085*A1234567890*
/E02480114/F2111234567890
/E02420046/A230/B3073*V1234567890*
/E02480686/F211ABC
/E02420566/A230/B3073*2PABC*
/E01270114/F2111234567890
/E01150046/A230/B3073*S1234567890*
/E00970629/F222GEAR
/E00420629/F21113-12-90
/W0002
```

Macro name: **MACRO-E**

This macro simply consists of the command **/W9999**, that will continuously print the last label printed (it will reprint the “status label” or it will simply feed the paper if nothing is present in the memory of the printer).

Macro name: **MACRO-F**

It prints two copies of a complex demo label that also includes proportionally spaced fonts and bit-mapped graphics, using the currently set parameters. Here follow the listing (bynary data of download fonts and graphics are not actually displayed) and a printed sample:

```
/Y...binary data...                    (download char. map to reset mega
font)
/D0160...binary data...                (download small font)
/D2160...binary data...                (download big font)
/D6176273...binary data...             (download mega font)
/C
/E00340345/Q0240120...binary data...          (download ST230
logo)
/E03910315/Q0220185...binary data...          (download flower
logo)
/E00010001/R02/M05760543003
/E00040087/R02/L0023902
/E00040172/R02/L0023902
/E00040230/R02/L0023902
/E00040236/R02/L0024302
/E02440004/R02/L1022802
/E02480004/R02/L1023402
/E00060007/R02/M02320076042
/E00120073/R02/F222/X000-02/T0LW23O
/E00050165/R02/F411/X000-80/T001
/E00180200/R02/F311/X000-02/T0#&-*024
/E00180229/R02/F311/X000-02/T0@ACcghZ
/E01810150/R02/F011/T1LABELEX
 ST230
/E02620298/R02/F011/T1Thermal
Transfer
Printer
/E03720452/R32/F211/X000-01/T1Label Editor for LABELEX ST230
/E00120525/R02/F212/T1Leptons Italia
/E02100525/R02/F211/T1S.p.A.
/E03300529/R02/F211/T1Via Meccanica, 5
/E02800496/R02/F211/T120083 Gaggiano (MI)
/E04040019/R12/F612/T1LW230/E02600265/R32/A221/T0/
B404808012345678907
/E00330253/R02/A223/T0/B00578012345678907
/E03110457/R22/A121/T0/B3114*ST*
/E02480282/R00/M00910046002
/W0002
```

Macro name: **MACRO-G**

It prints two copies of a demo label including several types of barcodes, using the default parameters stored in the non- volatile memory of the machine. Here follow the listing and a printed sample:

```
/Z/C
/E00200040/R00/A211/B0130222222222222
/E04000045/R10/A211/B11305555555
/E00200200/R00/A221/B41301234567890
/E04000200/R10/A211/B3130*ABCD*
/E04200045/R00/A211/B5050a1234b
/E05500160/R10/A431/B41001234
/W0002
```

Macro name: **MACRO-H**

It prints a demo label showing all the possible vertical expansions of the same character, using the currently set parameters. Here follow the listing (please note that all the **/F** commands are on the same line, that has been broken here only for readability) and a printed sample:

```
/C
/E00000280/F211A/F212A/F213A/F214A/F215A/F216A/F217A/F218A
/F219A/F218A/F217A/F216A/F215A/F214A/F213A/F212A/F211A
/W0001
```

Macro name: **MACRO-I**

It prints two copies of a demo label particularly useful to demonstrate the functionment of the speed and ribbon optimization. Ribbon saving can be directly switched from the front panel in OFF-LINE mode. Here follows the listing:

```
/C



1111111111111111111111111111111111111111111111111111



2222222222222222222222222222222222222222222222222222



3333333333333333333333333333333333333333333333333333
/W0002
```

Macro name: **MACRO-J**

It prints two copies of a demo label consisting of 20 lines of 50 small characters each, using the currently set parameters. Here follow the listing and a printed sample:

```
/C/F011
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
/W0002
```

Macro name: **MAPIBM**

This macro contains the **/Y** command followed by the character map corresponding to the MAP #7 of the font EPROM (IBM PC international character set). It may be used either to force this character set independently of what map is selected by default, or to release the memory space taken by the magnum and mega fonts.

Macro name: **MAPSTD**

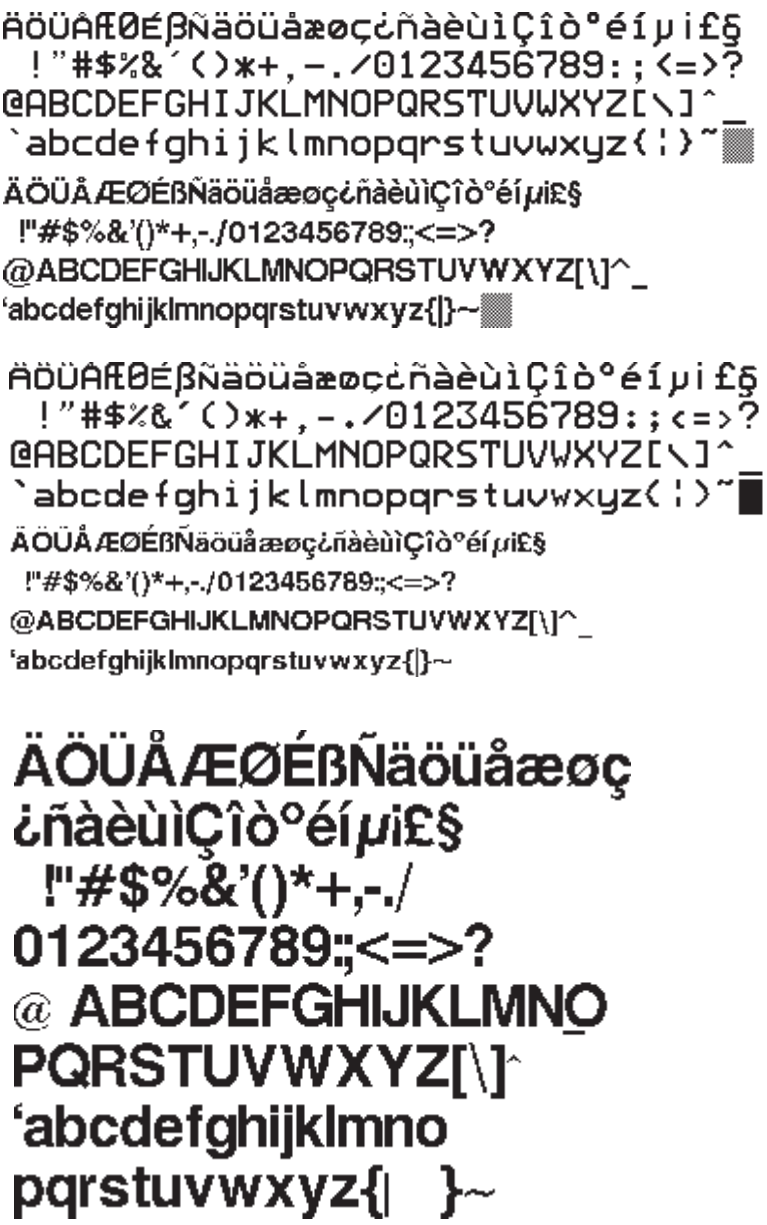
As above, but corresponding to the MAP #0 of the font EPROM (no character translation performed).

Macro names: **F8X8T**
F8X16T

These two macros download respectively a “small” and a “normal” proportionally spaced RAM fonts containing the characters shown in the following printed example:

Macro names: **HELV4B**
HELV7B
HELV14B
HELV24B

These four macros download respectively a “normal”, “big”, “magnum” and “mega” proportionally spaced RAM fonts containing the characters shown in the following printed examples:



ÄÖÜÅÆØÉß
Ñäöüåæøç
¿ñàèùìÇî
ò°éíµi£§
!"#$%&’
()*+,-./
01234567
89:;<=>?
@ ABCDEFG
HIJKLMNO
PQRSTUVW
XYZ[\]^
‘abcdefg
hijklmno
pqrstuvw
xyz{| }~

Macro names: **CHART4**
CHART7
CHART14

These three macros download respectively a “normal”, “big” and “magnum” proportionally spaced RAM fonts containing the characters shown in the following printed examples:

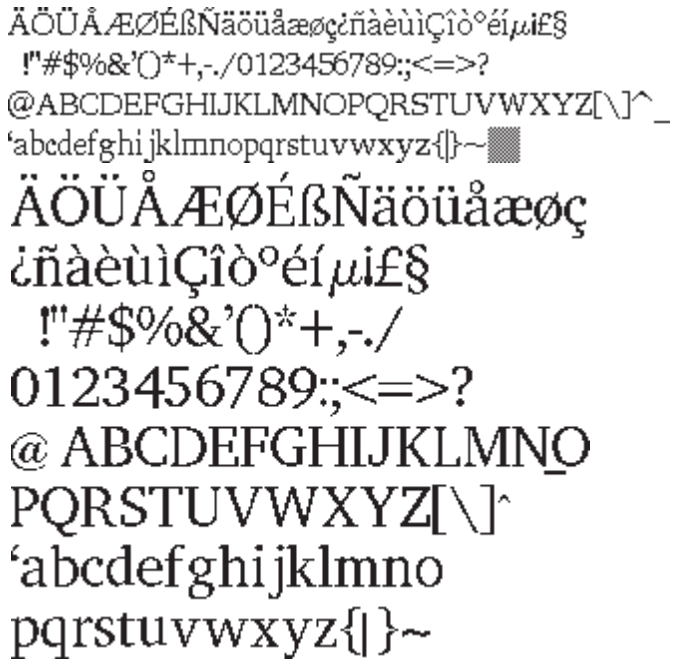
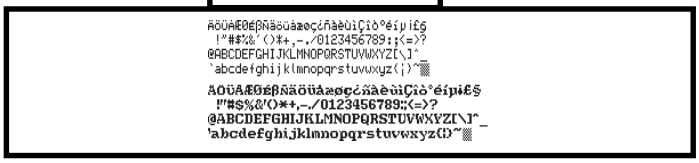


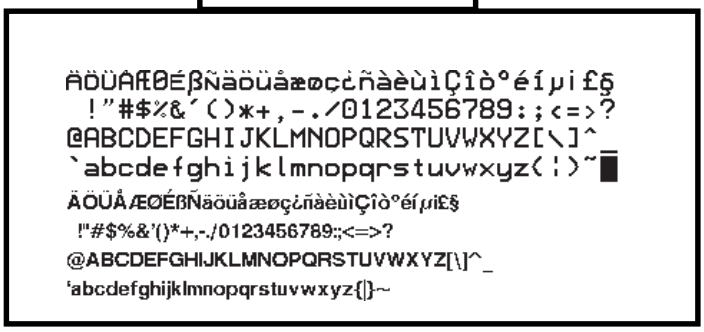
TABLE "A"

EXAMPLE OF STANDARD FONTS - SYMBOLS AND PICTURES

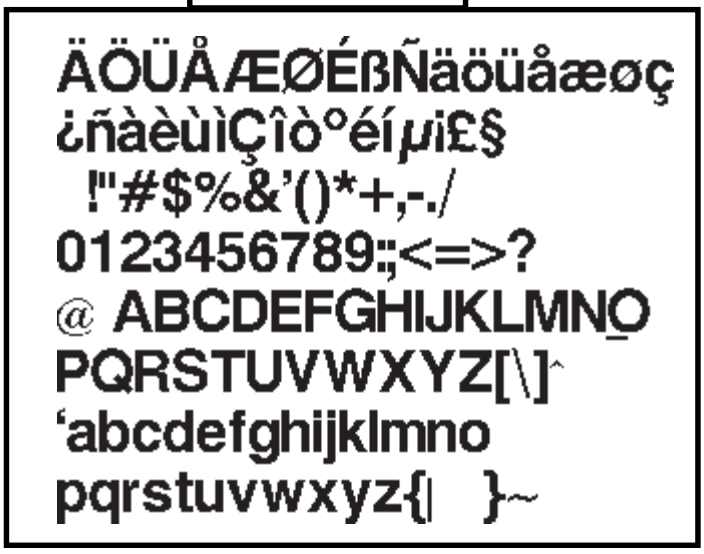
SMALL FONT



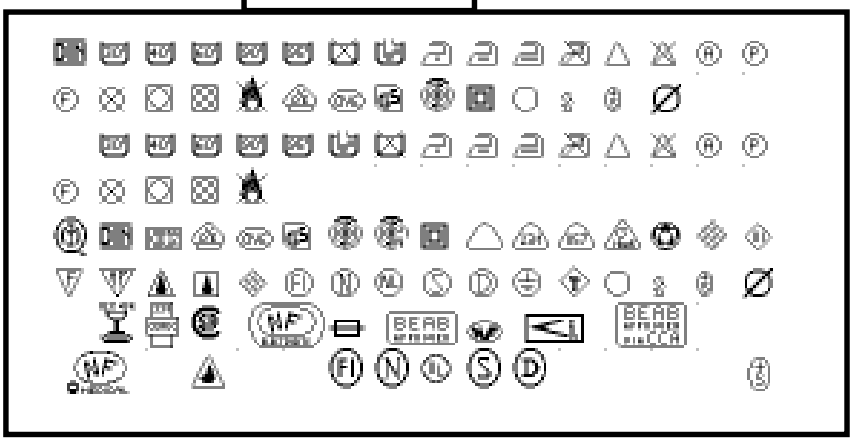
NORMAL FONT



BIG FONT



SYMBOLS



PICTURES